Light and Lighting

—No. 9 September, 1937 Price 9d

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STREET LIGHTING

The tremendous economy of electric discharge lamps over other forms of illuminant for street lighting is sufficiently well known to need no stressing. Other points in their favour include less liability to damage from vibration, long life and less sensitivity to voltage variation. In addition, the colour of Mercury Discharge lamps is undergoing steady improvement.

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THE E.L.M.A. LIGHTING SERVICE BUREAU, 2, SAVOY HILL, LONDON, W.C.2, IS MAINTAINED BY THE MANUFACTURERS OF THE FOLLOWING BRANDS OF LAMPS:

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Take this handy little instrument round in your pocket. You can use it dozens of times daily and get more orders for lighting equipment—more profitable business for you.

The WESTON "Lightometer" incorporates the famous "Photronic" photo-electric cell, an exclusive WESTON feature. Small, portable and of rugged construction, it does not suffer deterioration or change in calibration, even though exposed to direct sunlight. As a double-range instrument it gives readings of 0-50 and 0-500 foot-candles.

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Advert. of the Weston Electrical Instrument Co., Ltd., Kingston By-pass, Surbiton, Surrey. *Ph.: Elmbridge 6400*

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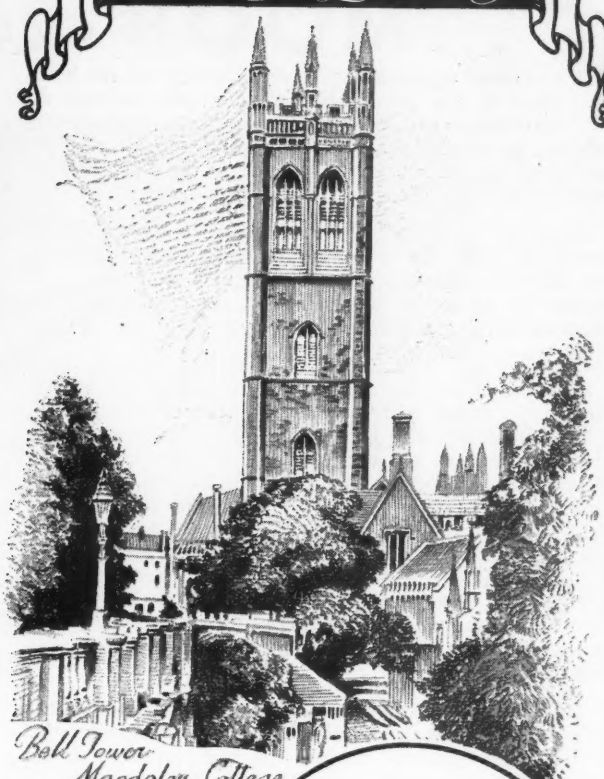

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KEMPSTON WORKS, BEDFORD.
AND HOME BRANCHES

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Lighting of Aerodromes*

General principles—desirability of concealing source—two main kinds of lighting—offices, hangars, and other buildings—outdoor lighting—landing lights—wind indicating—boundary marking

By G. V. DOWNER

IT is rather surprising that more advantage has not been taken of the possibilities of up-to-date methods of illumination in dealing with the problems of aerodrome lighting, in view of the great advances in recent years in our knowledge of how to control artificial light and how to put it to the most effective and economical use.

There are, of course, many opportunities on an aerodrome for the intelligent use of both indoor and outdoor lighting, but before making more specific suggestions it may be of interest to point out some of the general principles of scientific lighting which apply to practically all lighting problems.

One important fact which is becoming increasingly recognised, though it is still all too frequently disregarded, is that for nearly all lighting purposes it is unnecessary and inefficient to allow the source of light itself to be directly visible. Most light sources, such as electric bulbs and arc lamps, produce a very intense and concentrated light in a very small space, which at a short distance can be regarded as a point, and this, when directly looked at, causes dazzle and tends to confuse the eye. Much better, more pleasing and more efficient results can usually be obtained by concealing the source and spreading its light evenly over a certain area by means of suitable reflection and diffusing devices.

There are two main purposes for which artificial light is used, one being the illumination of objects and surroundings, in which the light need not and therefore preferably should not enter the eye directly from the source but only indirectly by reflection from the objects illuminated, and the other being the direct use of light for such purposes as advertising, decoration, or signalling, in which the lighting device is itself intended to be looked at direct, and does not illuminate anything else. In the case of aerodromes the latter category will include landing lights, wind direction indicators, and boundary marks.

In both categories we still too frequently find great extravagance and inefficiency due to thoughtlessness and ignorance, more especially in the use of far too many lamps, usually ill concealed, and producing glare and spottiness and uneven or badly distributed light. In the first category lack of even distribution and diffusion often causes discomfort owing to the prevalence of harsh conflicting and confusing shadows.

The first category, in the case of aerodromes, would include all interior lighting of offices, living quarters, hangars, workshops, and also general outdoor lighting. In all these cases it is possible with up-to-date methods to provide an even, well-diffused light penetrating all corners, glareless and practically shadowless, with a comparatively small number of lamps either concealed or sufficiently well shielded or diffused to be unobjectionable, with moderate first cost and with considerable economy in current consumption and upkeep as compared with the old methods.

The aim of this type of lighting is to emulate daylight, in which the sun's rays are refracted, reflected and diffused by the atmosphere, by clouds, trees, and other natural objects, and by the surface of the earth itself, so that the light is well broken up and dispersed in all directions, and every object receives all-round illumination; there is very little shadow except in direct sunlight, and even then there is plenty of light in the shadows. It is this all-round dispersion and diffusion of the light which enables us to see without discomfort under such a wide range of intensities from full daylight to semi-twilight, and by aiming at a similar type of light distribution we shall often find that we can see better and with more comfort with even less intensity than under the old methods.

It is particularly important to have good lighting of this type in hangars and workshops, etc., since important and accurate work has to be done in them, and any eye-strain due to unnecessary glare, confusion due to shadows or other difficulties in seeing clearly are likely to have even more serious consequences in such working quarters than in living quarters.

It would probably be beneficial to have luminous panels in the lower part of the walls of hangars or even in the floor, since work often has to be done on the underside of aircraft, so that it is desirable to have a well-diffused light underneath and on all sides of the machine. Such panel lighting could easily be designed so that men working beneath a machine would not get in their own light or throw appreciable shadows on their work; in fact, if desired, the whole floor could be formed of strong diffusing glass evenly lighted from below.

In the second type of lighting mentioned above, where the lighting device forms a sign intended to be looked at directly, it is equally true that in many cases a better result can be obtained by concealing the actual source and distributing its light over the surface of the device.

For instance, in the case of a ground V or other device for indicating the direction of the wind, instead of merely placing a row of lamps along the arms of the V, a much smaller number of lamps could be used and their light distributed evenly along the surface of the V, the lamps themselves being concealed, so that instead of an irritating row of dazzling spots, an evenly lighted white V could be comfortably seen from above, while at the same time the wiring would be simplified and replacements, cleaning, etc., reduced to a minimum. The same principle could be applied to an L or other letter or device.

Then, again, the boundary of an aerodrome might be indicated by a series of luminous strips or panels at ground level forming a chain outlining the boundary, or if desired a continuous luminous line could be provided all round the aerodrome. Projectors might be placed at corners or other suitable positions, for floodlighting the landing ground when a machine is landing, such projectors being preferably placed at a height of say 10 to 15 ft., or as high as possible consistent with safety from incoming machines, since the higher the projectors the less glare there will be in the eyes of landing pilots.

The direction of the wind could be indicated by switching on one or two of such projectors at first as a guide to the incoming pilot, the others being switched on when the machine was about to land. Different colours could also be used to indicate relative strengths of wind or other information.

The above are only a few suggestions intended to indicate some of the possibilities for the intelligent use of light in connection with aerodromes.

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* *Reprinted from "Electrical Industries."*

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Incorporating "The Illuminating Engineer."

Light and Lighting

Official Journal of the Illuminating Engineering Society.

32, Victoria St., London, S.W.1

Edited by J. STEWART DOW

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Vol. XXX.—No. 9 **September, 1937** PRICE NINEPENCE Subscription 10/6 per annum, post free

Principal Contents:

Measurements Revealed

IT has been well said that every science passes through two distinct stages.

In the first we merely observe and record facts. In the second we learn to measure and obtain numerical values.

Illuminating Engineering has long passed into the second stage. We can measure illumination with ease and in most cases with sufficient accuracy for practical needs.

Recent advances in the design of photometric instruments have enabled us to do something more—to *reveal* our measurements and to make them intelligible to the common man. (We do not say "the man in the street" because measurements of artificial light in the streets and their interpretation are not so very easy!)

Photometers based on the use of photo-electric cells reveal illumination by the movement of the pointer—something that the common man can understand and that several people can see at the same time. Even more remarkable is the latest device whereby the moving mechanism becomes part of a lantern slide and the movements of the pointer are thrown on the screen—so that a whole roomful of people can witness measurements of illumination being made.

Granted that there are snags in physical photometry, that precautions are necessary, that too great demands on accuracy should not be made, and that the reaction of such instruments to coloured light needs watching.

The development of these methods remains a great achievement—a great step towards bringing understanding of the principles of good lighting before the general public.

A.P.L.E. Folkestone Conference

These notes are necessarily prepared before the completion of the A.P.L.E. Conference in Folkestone (September 6 to 9), which will be dealt with in our October issue. We have previously given particulars of the chief papers to be read. It is to be noted that on this occasion all of these were prepared by experts connected with lighting firms or undertakings. The chief manufacturers of lighting equipment also arranged a very comprehensive display in the streets of Folkestone. It will be seen, therefore, that the lighting industry has played a substantial part in the Conference. The Rt. Hon. Sir Philip Sassoon, the First Commissioner of Works, whose delightful gardens at Lympne were visited during the period of the Conference, was the principal guest at the banquet on September 8. The number of members, visitors, and delegates attending this year exceeded 700, an increase on previous years—certainly a gratifying recognition of the importance of public lighting. For the moment it only remains to add that all the details of organisation of the Conference were again very efficiently handled by the Secretary (Mr. H. O. Davies) and his staff.

N.S.F.A. Public Lighting Session

In the next column we give particulars of forthcoming events in September and October. We should like to draw special attention to the forthcoming Public Lighting Session arranged by the National Safety First Association, to take place at the Hyde Park Hotel at 4.15 on October 8. Mr. A. Cunnington is to give an address on "Light, Speed, and Safety," and the discussion will be followed by a tour of London's streets. All members of the Illuminating Engineering Society and the Association of Public Lighting Engineers are cordially invited to attend.

I.E.S. Annual Convention (U.S.A.)

We have now received full particulars of the above Convention (the 31st), which is to be held at White Sulphur Springs, West Virginia (U.S.A.), during September 27 to 30.* There is, as usual, a comprehensive series of papers; those dealing with artificial lighting illumination of glass blocks, plastics, and hospital and art gallery lighting being perhaps of special interest at the present moment. There are also numerous reports on progress, finance, industrial and school lighting, etc., to be presented. At the "National Lighting Sales Conference," which occupies most of the opening day, the organisation of sales campaigns, demonstrations, and advertising will be discussed. It is interesting to note that there is to be no exhibition of lighting equipment this year. Evidently the Society (like the A.P.L.E. in this country) has found that intervals between such displays are expedient.

Forthcoming Events.

Sept. 20th. Opening Meeting and Exhibits of the North Midland Area Local Centre of the Illuminating Engineering Society *(Electricity Showrooms, The Headrow, Leeds)*; **7 p.m.**

Sept. 28th. Visit of members of the Illuminating Engineering Society to the **Engineering and Marine Exhibition,** Olympia.

Oct. 8th. Mr. A. Cunnington on **"Light, Speed, and Safety"** *(Public Lighting Session of the National "Safety First" Association, Park Lane Hotel (Tudor Room) London)*; **4.15 p.m.**

Oct. 12th. Opening Meeting of the Illuminating Engineering Society. Presidential Address and Exhibits *(E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2)*; Preliminary Inspection of Exhibits, **4.30 p.m.**; Meeting and Demonstrations, **5.30 p.m.**

Oct. 18th. Mr. J. F. Colquhoun on **Street Lighting** (North Midland Area Local Centre of the Illuminating Engineering Society *(Electricity Showrooms, The Headrow, Leeds)*; **7 p.m.**

Oct. 19th. Mr. A. E. Iliffe on **"The Economics of Factory Lighting"** *(Meeting of the Industrial Lighting Section of the Illuminating Engineering Society)*; **6.30 p.m.**

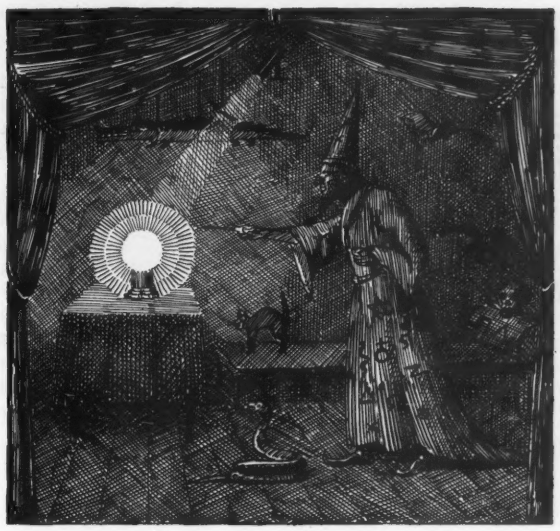
Oct. 29th. Address by Dr. C. C. Paterson, O.B.E., at the **Opening Meeting** of the Public Lighting Section of the Illuminating Engineering Society *(Research Laboratories of General Electric Co., Ltd., Wembley, Middlesex)*; **6 p.m.**

* We much regret that owing to an oversight the date and place of the Conference were incorrectly stated in our last issue (Aug., 1937, p. 216).

Light in Daily Life

(IX) The Marvels of Invisible Light

The Visible Spectrum—Infra-Red and Ultra-Violet Rays—Photography with Infra-Red Rays—Ultra Violet Rays, Effects on the Eyes and the Human Body—The Fading of Colours—Tests of "Fastness"—Fluorescence and Phosphorescence—Screens for X-Rays and Television—Scenic Effects—A New Means of Analysis—Testing Precious Gems—Detecting Fakes—The Ultra Microscope—Application of Fluorescence to Sources of Light.



In previous sections we have been concerned only with the effects of visible light.

But in actual fact all sources of light, including the sun, yield, besides this visible constituent, a great mass of radiation which is not evident to the eye and yet is of similar general character—differing from the visible light only in the wavelength and frequency of vibration. The eye is sensitive only to a single octave of vibrations ranging from the extreme red (with a wavelength of thirty-two millions of an inch) to the extreme violet (wavelength fifteen millions of an inch). Between these extremes we have in order the colours orange, yellow, green, blue, and indigo. Mingled together in suitable proportions all these colours give what we call "white light."

The separation of white light into its constituents by means of a glass prism is to-day a familiar lecture experiment. We see stretched out before us the colours in the order outlined above, their position determined by the differing degree in which they are bent in passing through the prism.

But a wide range of octaves of vibrations exist on either side of this narrow luminous band.

Below the red, and of greater wavelength than visible light, are the infra-red rays. Beyond the violet, and of shorter wavelength than visible light, are the ultra-violet rays. Both have qualities of great interest, though it is the application of the ultra-violet rays that has excited most interest during recent years.

The Infra-Red Rays.

About the effects of the infra-red rays not a great deal is really known. Their effect on our bodies is experienced as heat, and they are exploited for medical treatment in the radiant heat apparatus now familiar. But infra-red rays of relatively short wavelength have another interesting property—the ease with which they can penetrate the atmosphere.

Visible rays are to some extent checked in passage through the air, the red and orange rays penetrating best (as we see at sunset), whilst the blue rays tend to scatter, creating the luminous haze which softens the outlines of distant objects and often lends distinction to the British landscape. The ultra-violet rays are still more severely absorbed—so much so that scientists exploring those of very short wavelengths are obliged to receive them on their instruments through a vacuum.

Photography with Infra-Red Rays.

This fact has an important bearing on the photography of distant objects. Too often the visible rays form a veiling haze which fogs the impression and prevents a clear image being obtained. A great advance was thus made when it was found possible to prepare plates highly sensitive to the infra-red rays, which pass unchecked and unscattered. It is now many years since Sir William Abney showed the possibility of taking a photograph of a steaming kettle in a dark room, by its heat rays alone. Many years later Professor Wood, of Columbia University, applied the same principle to the taking of astronomical photographs and scenes situated at a vast distance in the Yosemite Valley. Of recent years continual advances in the preparation of films and plates highly sensitive to the infra-red rays have been made. Such materials are now widely used both in landscape photography and in telephotography, i.e., the obtaining of apparently near views of distant things with a telescopic lens.

Ultra-Violet Rays.

In the simpler and more usual forms of photography use is made of ordinary films and plates which are sensitive to the visible and ultra-violet rays—indeed, the existence of the ultra-violet region was first revealed by means of photography.

The ease with which photographic action is achieved with these rays is but one instance of their power to excite chemical action, of which advantage is taken in various industrial processes. A distinction must be drawn, however, between the range of radiation slightly beyond the visible, which is comparatively mild in effect, and the more extreme range beyond, the action of which, generally speaking, becomes more severe as the wavelength decreases.

Sunlight, as experienced in this country, contains only the moderate ultra-violet constituent which produces the familiar sunburn of the skin, is believed to have a general useful tonic action, and in the case of certain ailments (tuberculosis and rickets, etc.) appears to have a valuable curative influence. Exposure to normal sunlight, therefore, if effected with reasonable prudence, is unlikely to cause injury. In mountainous regions where, owing to the smaller depth of atmosphere traversed, the proportion of short-wave radiation is greater and the action more violent, care is necessary. Severe inflammation of the skin and eyes ("snow-blindness," etc.) may be experienced. A similar danger arises in close proximity to artificial sources rich in ultra-violet radiation, such as the arcs used in welding or cutting metal. Masks to cover the skin and goggles to protect the eyes are advisable. Whilst, as indicated above, exposure to the rays of the sun in Britain is unlikely to do harm unless applied in excess, some little caution is desirable in making use of sources of light (such as arcs between special electrodes, high-pressure quartz tube mercury vapour lamps, etc.) which are known to be rich in ultra-violet rays of

short wavelength. Exposure to such radiation is an element in medical treatment and should, therefore, preferably be adopted under medical advice.

The very quality which, in excess, is liable to injure healthy eyes and skin is, however, most valuable in treating diseased tissues, e.g., in the treatment of skin diseases, for its germicidal action and for the sterilisation of water.

In the case of ordinary lighting fittings, no danger from ultra-violet rays need be feared. In the cases of "incandescent" sources (mantles and filaments) the light-giving qualities of which depend on temperature, the percentage of ultra-violet radiation—especially of the short-wave variety—is minute. Sources which depend on the luminescence of gases and vapours may emit a higher proportion of ultra-violet radiation, but the glass envelope suffices to absorb all the most active radiation and affords complete protection.

The Fading of Colours.

Long sustained exposure to bright sunlight is apt to cause gradual disintegration of many materials owing to obscure chemical actions. The perishing of rubber and the slow crystallisation of certain alloys may be at least partially explained thus. Perhaps the most noteworthy chemical effect of ultra-violet rays is that revealed in the gradual fading of colours—a serious problem for the curators of picture galleries and museums where are rare and unreplaceable pictures and other coloured objects are housed. Whilst ultra-violet radiation, and to a smaller extent visible light, is the chief agent in causing fading, the effect is accentuated by temperature and humidity. With a knowledge of these facts something can be done to guard against the danger. Glass and varnish to some extent protect pictures. Shielding from direct sunlight is also a help. It is, however, difficult to afford protection against a process which proceeds remorselessly for centuries. In order to be seen and enjoyed a picture must be adequately illuminated, and it would be unjust to the present generation to hide it from view in the interests of those to come.

Tests of "Fastness."

The knowledge that the fading of colours is so closely associated with the effect of ultra-violet radiation has led to artificial tests of the fastness of colours used in the dyeing of carpet-making industries. It was formerly necessary to wait for the relatively slow effect of continuous exposure to daylight—a process which might take months, and is difficult to apply in northern latitudes where prolonged spells of bright sunshine are unusual. By the help of modern intense sources of ultra-violet energy the process may become a matter of hours instead of months, and may proceed independently of the vagaries of climate.

Phosphorescence and Fluorescence.

Among the most striking effects of ultra-violet light are those produced when certain materials are excited by them so as to glow "with their own light." When the effect occurs only whilst the radiation strikes the material excited it is termed "fluorescence"; when it persists after the stimulus ceases, "phosphorescence." The former is the more usual and the more widely applied phenomenon. Genuine phosphorescence is exemplified chiefly in the so-called "luminous paints." Calcium sulphide and zinc sulphide, which respectively glow with blue and green light after excitation, are among the most strongly phosphorescing materials. The effect is not usually of very long duration, though a feeble glow may still be detected some hours after exposure. (The so-called phosphorescence of paints used to coat the dials of watches and instruments used by night is really fluorescence, as it is caused by the continuous bombardment of zinc sulphide by radium bromide, mesomorium, and similar radio-active materials.)

Screens for X-Rays and Television.

Although it has been declared that practically all substances will, after stimulation, show *some* degree of phosphorescence, the effect is usually minute and very transient. The range of materials showing marked fluorescence is much greater, and the effect, whilst the stimulus is applied, quite vivid. The variety of colour that the glow may assume is also very considerable. Two notable examples of the application of fluorescence in practice are to be found in the screens used by X-ray operators and in television. In both cases it is clearly desirable that the effect should be limited to *fluorescence*—any appreciable after-effects superimposed on a new image would obviously be troublesome.

Transformations and Scenic Effects.

Chemical substances can be prepared to give a wide range of colours. Screens coated with them which show an apparently blank surface by ordinary visible white light may reveal a landscape glowing in vivid hues when excited by invisible ultra-violet rays. It is likewise possible to cause an amazing transformation scene when ultra-violet rays are substituted for visible light—a device which has been ingeniously applied to pictorial advertisements. Fluorescence has also been applied with good effect on the stage in connection with illusions and in scenic and costume displays, in which striking colour changes play a part.

A New Means of Analysis.

The use of "invisible" inks which reveal themselves only when subjected to ultra-violet rays has formed the basis of "secret writing," which has figured in many romances dealing with crime and espionage. All but obliterated writing on old manuscripts has been recreated by exposure to ultra-violet light and the image recorded by means of photography. But the rays act as detectives in many other ways. Many fatty materials, butter, margarine, etc., and oils show strong fluorescence and may be distinguished one from another by tests of this quality. Similarly genuine precious gems can be thus distinguished from imitations. It is even possible to differentiate between gems of the same type, e.g., Japanese and Indian pearls, or diamonds from South Africa and Brazil.

Of special interest is the use of ultra-violet light in the detection of "fakes." Its value in the study of handwriting has already been mentioned. It may be possible thus to distinguish original writing from later alterations (carried out possibly with a slightly different ink), and to observe where skilful erasures have been made. Similarly, concealed joins in furniture, the addition of newer varnishes and lacquers, etc., may be detected. Perhaps the most interesting of all is the application of the ultra-violet testing cabinet to rare postage stamps. Joins and repairs in stamps can be made with such skill as to be invisible under the microscope, but they are frequently visible under ultra-violet rays—especially where newer paper, which fluoresces in a different way from the original material, has been introduced. Forgeries which, by visible light, resemble the genuine stamp quite closely may appear quite a different colour when caused to fluoresce. Forgeries of rare overprints (e.g., "errors") may be spotted by the fact that the ink fluoresces in a different colour from the original.

A valuable feature of all such tests is that they may be applied without any risk of injury to the specimen.

The precautions necessary in "filtering" the ultra-violet radiation naturally depends on the strength of the fluorescence. Theoretically, all that is necessary is a source rich in ultra-violet, screened with a

special glass which, so far as possible, absorbs all visible light but allows ultra-violet radiation to pass. In practice this is rather a counsel of perfection. *Some* visible light must be tolerated, and if the fluorescence is vivid its presence is no serious drawback. Where the fluorescence is but faint, and the material is light in tint—papers and parchment are usually typical of this condition—visible light should so far as possible be excluded.

The Ultra Microscope.

It remains to mention one other means of analysis —the ultra microscope A definite limit to the minuteness of objects visible in a high-powered microscope exists, due partly to the limits of resolution by the apparatus and partly to those of the human eye. But it is often possible to detect the existence of objects too minute for their shape to be studied, merely because of their brightness. For this reason we can detect the existence of distant bright stars, even though the angle subtended at the eye is far too small for them to be seen in the ordinary fashion.

In the same way, if a very powerful beam of visible light is directed sideways into a cell of fluid under the microscope it is often just possible for minute things—too small to be perceived in the ordinary manner—to be detected as points of light. We may not be able to examine their shape or size, but we become aware of their existence and can study their motions, and particularly their combinations one with another. This process has proved of considerable value in the study of minute bacteria.

By applying ultra-violet in place of visible light, and utilising the camera instead of the human eye, objects of a still lower order of magnitude may be studied. It was this process which led to the reported discovery of the germ of cancer a number of years ago.

Fluorescence Applied to Sources of Light.

There remains a most fascinating application of fluorescence—its use as a means of modifying quality of light and possibly improving the efficiency of existing sources. For the moment it need only be said that the matter is of special interest in connection with some of the latest types of high-pressure electrical discharge, the spectra of which contain a considerable amount of ultra-violet radiation, as well as the useful visible light. Some reference to this subject will be made in the next and final article of the series.

Colour Lighting in Bridlington's New Concert Hall

Holophane Moulded Contour Lighting at the new Grand Pavilion, Bridlington. (Architect: Mr. P. Maurice Newton; Electrical Contractor: W. T. Drabble.)

Bridlington's recently opened Grand Pavilion Concert Hall takes the place of the old Grand Pavilion demolished in 1936. The auditorium is of the stadium type, having the rear portion of the floor raised several feet higher than the main floor, which can be converted into a dance hall for 300 persons. The whole floor will take a seated audience of 1,700, and affords a clear view of the 40 ft. stage.

The stage equipment, very complete, includes Holophane colour-lighting, comprising three four-colour battens, a foot-light, wing flood trolley units, cyclorama lighting, and the latest type of four-colour dimmer switchboard with twenty-eight control ways. Holophane, Ltd., also furnished four magazine type arc spotlights, two used on the stage and others from chambers at the back of the hall.

In the auditorium there are two moulded contour lighting coves which carry over 460 feet of troughs accommodating 100- and 40-watt lamps with amber and coral pink colour filters. Four 6 ft. diam. indirect bowls serve the two wings of the hall. A striking feature is the proscenium curtain by Holophane, Ltd., executed in black velor and bearing a striking underwater scene.

Public Lighting with Gas

A number of 12-light lamps have been installed by the Gas Department in one of the main streets of Barrow-in-Furness.

Eight 1,000 c.p. high-pressure lamps have recently been installed to floodlight the Greenwich Borough Council's Baths.

Under a new lighting scheme estimated to cost £750 the centre of the town of Droitwich is being relighted. Twenty powerful lamps of modern design are being installed. On the main Birmingham-Worcester road 250 yards have been fitted with seven 6-light automatically controlled lamps, mounted 20 ft. high, with a 5-foot projection over the roadway. Since 1919 the number of gas mantles in use in public lamps in Droitwich has increased over fivefold.

The streets of Broadway, the famous Cotswold beauty-spot, are now to be lighted by gas under a three years' contract.

Important contracts have been secured by the South Suburban Gas Company. Fine stretches of lighting are to be seen at Sidcup and on the main Hastings road between Bromley Common and Farnborough. On this road and on the newly widened road from Bromley to Hayes clock-controlled lamps, on high columns, have been installed, and on the Hayes road the refuge islands are equipped with gas-illuminated bollards.

About 248 lamps are affected by a recent seven-year agreement for the urban district of Frimley and Camberley. Other contracts in this area include Crowthorne, Henley, Sandhurst (seven years), Twyford, Wargrave, and Wokingham (three years).

A new five-year contract for St. Helier, Jersey, will involve a 30 per cent. improvement in lighting, with a 10 per cent. reduction in cost.

Great Dunmow, Essex, will continue to be lighted by gas under a new five-year contract. In one area to which the mains do not extend Calor gas is being used.

Other contracts include: *Three Years*: Misterton, Mundesley, North Walsham, Swaffham. *Five Years*: Blandford, Findochty, Halling, Halesworth, St. Ives (Hunts). *Ten Years*: Crewkerne. *Fifteen Years*: Feltham, Snodland.

Electric Street Lighting

Edinburgh.—The use of mercury discharge lamps continues to increase and £20,000 per annum is now spent on electric street lighting. Energy charges are based on 0.9d. per unit for the first three million units and ¾d. per unit thereafter.

Sheffield.—Penistone Road and Penistone Road North are now being lighted with 124 high-wattage lamps. About 1,000 lamps were erected during the past financial year, and on March 31 over 8,000 were in use.

Alnwick (Northumberland).—A quotation from the North Eastern Electric Supply Company for the lighting of Bondgate Without by mercury discharge lamps, at a cost of £48 17s. for the lighting season, has been accepted—and likewise a tender of £84 for seven new lamps for a building scheme in St. Thomas's Close.

Hayes (Middlesex).—It is proposed to light Uxbridge Road from Southall to Church Road by mercury discharge lamps attached to trolley bus poles.

East Grinstead.—Tests are to be conducted in the autumn with mercury and sodium discharge lamps.

Poole.—Sanction has now been obtained from the Ministry of Health for a loan to enable certain roads to be lighted by electricity.

Camberwell.—By November 11 the street lighting electrification scheme will be completed. Over 140 route-miles of street lighting improvements are involved.

Bury (Lancs.)—Experiments on the floodlighting of crossings, the external lighting of beacons, reflecting studs in the roadway and lamps hidden in kerbstones for crossing illumination are to be made.

Stoke-on-Trent.—132 400-watt mercury discharge lamps, at a cost of £4,000, have been erected. The lamps are 25 ft. high with 6 ft. overhang and 150 ft. staggered spacing. The new lighting extends over 3 miles 680 yards.

Bristol.—In the last financial year 366 discharge lamps (36 sodium, 53 150-watt mercury, 265 250-watt mercury, and 12 400-watt mercury) have been installed. The spacing averages 50 yards. The larger lamps are mounted 25 ft. high and the smaller lamps 15 ft.

Preston.—There are now 321 500-watt dual-type (combined discharge and filament) lamps in general use and an additional 57 300-watt lamps of the same type at special points. The lamps operate throughout the year from dusk until dawn, and energy is supplied at 1d. a unit.

The Lighting and Watching Act (1833) has recently been adopted at Donnington Wood, Cotherstone, and Cheddington. These villages are to have electric lighting. Another village, Boughton, now uses electricity to light its seventeen street lamps at a cost of £76 to £78 4s.

New Methods in Street Lighting Research

By H. H. Ballin, B.Sc. (Econ.),

Exterior Lighting Dept., The General Electric Co., Ltd.

The B.S.S. Specification—Road Lighting and Road Inspection — Brightness Meters — Photographic Brightness Records—Perspective Views of Installations — Appearance of Lighting Units — The Lighted Roadway—The Problem of Glare—Tests of Components of Street Lighting Units.

The terrifying statistics of road accidents which have aroused public concern about the safety on the roads, have also focussed public interest on the research of scientists into the problems of street lighting, and on their endeavour to bring the art of street lighting up to a level at which the quality of an installation can be assured and determined.

The British Standard Specification No. 307, 1931, must be considered as a milestone in the progress towards good street lighting, in emphasising the importance of adequate mounting height, regular arrangement of units, and sufficient lighting intensity. The attempt to draw up a specification for street lighting resulted in simplifications of the problem, but at the same time abstractions from reality. Consequently, the specification, unless carefully interpreted, does not necessarily ensure the attainment of the objective, good street lighting.

Good visibility on the road—the criterion of a good installation—is the result of a combination of a number of factors, and only an understanding of their separate influences and complex interaction makes it possible to describe and specify the features of a desirable installation.

It is not the writer's intention in this article to survey the present state of knowledge, a contribution to this journal in September, 1936, very aptly summarised the position at that date, and an authoritative statement may be expected in the near future from the Ministry of Transport Departmental Committee on Street Lighting.

It may be more interesting to discuss the methods used in the laboratories and on the night tests by those engaged in street lighting research.

New Tools.

Since the days when the activities of street lighting research were governed by clauses of the B.S.S., a great deal of progress has been made in the understanding of the mechanism of street lighting. Old tools have found new applications and new ones have been developed, enabling us to compare

Fig. 1.

and to measure at least some of the factors which have proved relevant.

The first and most important tool is, characteristically enough, the human eye. The fetish of test-point illumination has lost its charm; the objection of the man in the street that the road was not comfortable for driving is no longer met by a haughty reference to results obtained on a horizontal test-plate by complicated instruments.

Achievements and mistakes are quickly revealed by a careful inspection of installations. Nothing is more instructive than a night drive through lighted thoroughfares with critical eyes. There are roads illuminated absolutely in accordance with the B.S.S. as regards mounting height, spacing, and illumination, but visibility is poor. Wide bands of darkness cross the carriageway creating a confusing zig-zag of light and shadow. Bad kerb visibility, complete darkness of bends, inconspicuous junctions may render objects invisible and the course of the road uncertain (Fig. 1).

Many of these troubles can be traced to insufficient light output or unsuitable light distribution, unfavourable road-surface material, and especially to incorrect planning of the lamp positions.

There are other roads with apparently uniformly bright surfaces where the driver can proceed in comfort and notice obstructions and danger spots from a safe distance (Fig 2); roads which, because

Fig. 2.

Fig. 3.

of their good lighting, have become by-passes relieving the traffic congestion on the main arteries.

Road inspection is a great help for the research worker, and is indispensable for the engineer in charge of the layout. The roads to be lighted in practice are not the straight, level thoroughfares necessarily envisaged by the B.S.S. They are more often winding with many junctions, hidden side entrances, railway bridges, trees, and other obstructions. Unless these special circumstances are noticed and taken into account in the street lighting scheme, the result will be unsatisfactory. The inspection of roads is, therefore, most important and, at present, the only means to solving some of the problems.

There are, however, several new instruments which greatly assist scientists and enable them at least to

Fig. 4.

make a beginning with the quantitative measurement of phenomena as opposed to their mere inspection.

The level and distribution of brightness of various parts of the field of view has lately assumed a greater importance than illumination, and as a first step in this direction there is the Brightness Meter, which enables the brightness of any part of the road to be measured by comparison with a series of light spots of known values, illuminated by a lamp inside the meter (Fig. 3). With the aid of this meter it is possible to make the camera a useful friend, always ready to refresh the memory, and a reliable and objective reporter of the night appearance of the street.[1] Photography is also used in more detailed photometric analysis of brightness distribution (Fig. 4): a given brightness of the road appears as a certain density on the photographic plate, and with the aid of a densitometer incorporating a photo-electric cell[2], all equal densities can be determined and plotted, using certain known brightnesses as a standard of reference. Thus it is possible to construct an accurate system of "con-

Fig. 5.

tour lines" of brightness which provides important data for the study of street lighting installations, the measurement of the reflecting properties of road surfaces, and the determination of the basis on which new installations can be planned. (Fig. 5). The old methods of *photometry* have had to undergo important modifications, as with the arrival of new light sources of peculiar colour, problems of heterochromatic photometry had to be solved.

The New Angle of Approach

The development of new tools indicates that the subject of study and the methods of approach have completely altered. Previously an installation was, as it were, viewed from above; the light sources, to use the words of the B.S.S., formed a repeat pattern

[1] See R. G. Hopkinson, Trans. Illum. Eng. Soc. Vol. I, page 19.

[2] See J. M. Waldram, Journal of Scientific Instruments, Vol. XIII, No. 11.

of which each unit could be treated as characteristic for the whole installation. To-day the perspective appearance of a road as seen by the user, driver or pedestrian, forms the centre of research. Good appearance of a street lighting installation, it is true, does not necessarily mean good visibility: intricate problems of vision, threshold brightness, the question of minimum brightness or colour contrast between background and object, have to be settled before the relation between visibility and appearance can be precisely established, but these are refinements compared with the fundamental importance of other research.

In the perspective view of an installation, each individual light source is unique in its effect on road brightness and it follows that research has first to concentrate on single light sources, before investigating the way in which a satisfactory installation of a number of units can be planned.

The Single Unit.

The first task is to examine the mechanism by which the light emitted by a lamp is transformed into road brightness, i.e., into light reflected from the road surface towards the road user. With a given light distribution and mounting height of the lantern different road surfaces produce varying results and their complex properties can only be ascertained by lengthy series of photometric and photographic tests and calculations[3].

Interest in this work is just beginning to be taken by the road engineers, and it is hoped that a good compromise may one day be found between the optical and mechanical properties of the road surface. At present many of the standard materials make the task of the lighting engineer extremely difficult.

In the meantime, the data on typical road surfaces are used in the design of light distributions supplemented by tests of the unit in the street under actual working conditions.

Road Appearance.

It is not proposed to encroach on the scientists' preserves by reporting their findings, but one or two examples will serve to illustrate the manner in which different light distributions affect the appearance of the road. Before doing so, however, it may be useful to make clear what kind of road appearance is desirable. Under the conditions of street lighting, objects are visible by silhouette against the bright background of the road surface. In a good installation, therefore, lighting units are planned in such a way that the "bright areas one associated with each lighting unit, are made to coalesce and produce a background of sufficient brightness and uniformity to reveal adequately an object in any important position."[4]

[3] See M. Cohu. Trans. Illum. Eng. Soc. (London), Vol. I. p. 163, and J. M. Waldram, Illum. Eng. (London), Vol. 27, page 305 et seq.

[4] G. H. Wilson, Road Lighting and Road Surfaces, p. 4.

Fig. 6.

Theoretically, if the shape and extent of the "bright areas" produced by a lantern are known, it should be possible to design a satisfactory installation, but with some distributions this might necessitate an impracticable arrangement of units. In street lighting, as in other fields of human activity, the problem is economic as well as technical. It is the task of the research worker and lighting engineer to design the best possible scheme for a given and often very limited expenditure. The lanterns are designed and the mounting height fixed so that, subject to the limitations of glare, the most extensive bright area is produced, with the result that the spacing can be relatively long without causing black patches and dark shadows.

The fact that a carefully balanced proportion of light emitted at high angles to the vertical (between 75° and 85°) results in considerable lengthening and widening of the bright area is illustrated by an experiment in which the main beams of the lanterns are first directed at an angle of 72° to the vertical, and afterwards focussed up to 82°. The accompanying photographs of such an installation show the greater uniformity of brightness, and therefore better appearance that can be obtained with the latter light distribution. (Fig. 6 and 7.) It is interesting to note at the same time that the test-point illumination in

Fig. 7.

the less satisfactory installation is nearly twice as high as in the more uniformly bright road.

Complete uniformity of brightness, although the ideal, is probably not economically possible, and it is most important to establish the degree of uniformity that is necessary to produce a good installation. As the brightness of the surface is built up by the contributions from several light sources, the positions of units have to be chosen in such a way that the permissible degree of non-uniformity is not exceeded. The near side traffic lane of the carriageway, especially, should be as nearly uniformly bright as possible and, consequently, the units should be placed closer together on bands than along straight stretches. The exact positions depend, of course, on the width and lay-out of the road.

The Problem of Glare.

Reference has been made above to the phenomenon of *glare*. If the light emitted by the lantern at certain angles is of too high an intensity, a feeling of discomfort and distraction may result. Too much light at high angles must defeat its own object by making the driver less capable of perceiving contrasts of a low order. It is a subject of continuous research to find out the maximum contrast between the brightness of the light source and that of the surroundings which does not give rise to glare. In an endeavour to reduce discomfort glare-diffusing prisms and flutes are incorporated in the optical system of some lanterns to reduce the brightness and make the whole surface of the refractor appear evenly flashed.

Street lighting is no longer carried out by rule-of-thumb, and on the basis of the research already done, street lighting installations can be scientifically planned.

Fig. 8.

Tests of Components.

The study of the fundamental problems of street lighting is only part of the research activities on this subject, for the best optical system is useless, if the lamps fail or if the lanterns fall to pieces. Routine tests are employed to check the efficiency and life of the commercial lamps; in addition, continuous research is carried out to improve the existing lamps and develop new and still better ones. Only with great difficulty was a glass found suitable to withstand the extremely high temperatures, pressures, and chemical attacks in some electric discharge lamps. It is necessary to safeguard the bulbs from climatic conditions by the use of weatherproof lanterns, whilst the glass for refractors must be suitable for the very complicated and exact optical systems and must not crack under the most stringent working conditions of wind and rain. To ensure all this, the lantern is subjected to various tests with the lamp burning, such as sudden temperature drops and spray tests, where the lantern is exposed to a rainfall of 40 in. per hour—four times as much as a tropical downpour (Fig. 8). Even resistance to wilful damage has been ascertained by stone-throwing tests.

The auxiliaries used with discharge lamps undergo similarly severe trials; bump tests ensure that the air gap of the choke does not alter in transit or normal handling on site; thermal tests ascertain whether the choke is capable of withstanding overload; insulation tests subject them to excessive voltage.

It would be impossible to describe all the research tests and activities, which examine even the smallest detail, and it would be tedious to do so; but if this article has succeeded in giving an impression of the spirit and manner in which the complicated problems of street lighting are solved by scientists, it may help a little in closing the gap that is so often found between theory and practice. Without a knowledge of the problems involved in street lighting a good installation is merely a matter of chance. On the other hand, in order to keep in close touch with the practical world, the research worker needs an insight into the limitations and difficulties which the lighting engineer has to face. Only by close co-operation between both are further improvements and progress assured.

The World's Largest Telescope

In "The Australian Engineer" (July 7) there is an interesting survey of existing large telescopes utilising mirrors which have progressively increased in diameter from forty inches to 100 inches. The latter telescope, at Mount Wilson, California, has the effect of diminishing the distance of the moon, approx. 250,000 miles, to a few hundred miles only. Even this, however, is by no means the limit. A telescope with a mirror 200 inches in diameter composed of boro-silicate glass is being constructed. The molten glass was allowed ten months to cool. The complete telescope to be erected at Mount Palomer, also in California, will not be ready for work before 1940.

Improved Lighting at Southport

In such a town as Southport, famous as a watering place and for its distinctive thoroughfares (e.g., Lord-street and The Promenade), the local authority naturally exercises special care in the selection of the lighting.

A few years ago, when the Southport Lighting Committee considered the re-modelling of the lighting of Lord-street, a decorative type of lantern, its shell made of supported copper and fitted with rain-drop glass, was adopted. These lanterns are fitted with prismatic glass refractors and 750-watt lamps.

New standards fitted with these lanterns were erected in staggered formation on each side of the street. They have a longer arm projection than the old-type standards and further, are of a tubular, fluted steel design.

Up to this time the lighting on the Promenade had been effected from one side of the road only. With the release of the original Lord-street standards it was then possible to light the Promenade in staggered formation from each side of the road. The type of decorative lantern used in Lord-street was again adopted but in this case was fitted with 500-watt lamps.

At the beginning of this year the Corporation commenced a scheme for widening and improving the Promenade. On the seaward side a decorative balustrade has been constructed.

The scheme of the borough engineer, Mr. A. E. Jackson, M.Inst. C.E., provided for island sites in the centre of the widened portion of the roadway, where the old type of lighting in staggered formation was abandoned and centre lighting substituted.

Fig. 1. Showing the twin decorative lanterns on ornamental standards.

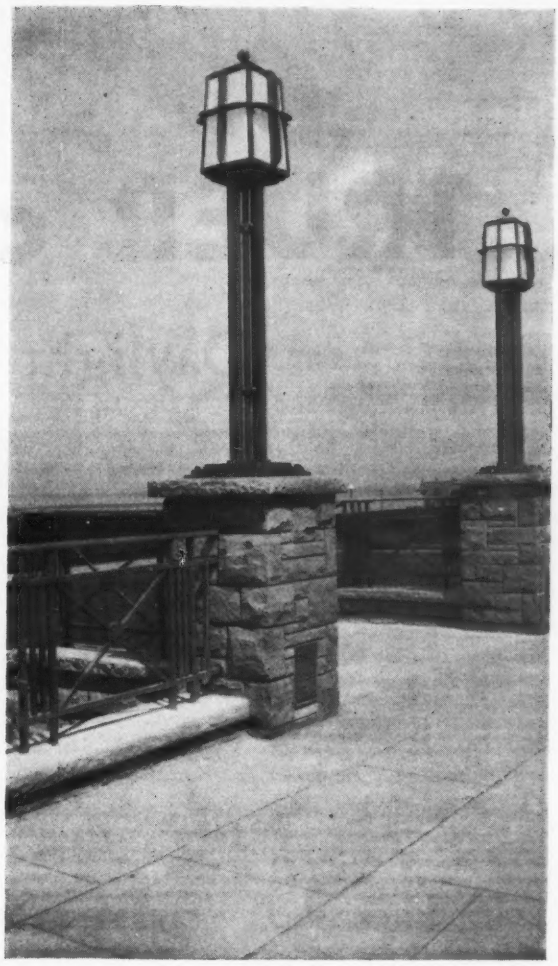


Fig. 2. Showing the new decorative lanterns mounted on the balustrade.

The old lighting columns were constructed in three portions. Use was made of the lower portion of the old standard in the new scheme and on these are mounted twin decorative lanterns, similar to those already in use in Lord-street and the Promenade, and suspended from brackets at the top of the standards referred to.

The brackets have a projection of 5 ft. from the centre of the standard. On the decorative balustrade previously referred to, ornamental lanterns (equipped with 200-watt lamps) and standards have been superimposed at intervals. The standards are approximately 6 ft. 6 in. high above the top of the balustrade. The photographs give some idea of the completed scheme.

The lanterns for the central lighting and balustrade lighting were manufactured for the Southport Corporation by the General Electric Co., Ltd.

The whole scheme gives a pleasing appearance. The roadway, both in Lord-street and also on the Promenade, is well lighted and the decorative lanterns, mounted on the balustrade overlooking sunken gardens and the Promenade walks with their flower-beds on the footpath, are attractive both by night and by day.

Hints on the Use of Portable Photometers

In what follows we give an abridged version of the useful "Recommendations Concerning the Use of Portable Photometers" which recently appeared in the Transactions of the Illuminating Engineering Society *(Trans. Illum. Eng. Soc., London, Vol. II., No. 5, May, 1937).* In the case of each type of instrument the first six recommendations are reproduced in full. The further recommendations, which are in the main common to both types, are summarised at the foot of the page.

(a) Visual Type Employing Separate Test Surfaces.

1. CALIBRATION.

Instruments should be checked against a standard light source at frequent intervals. Periodically the instrument should be completely recalibrated and the electrical connections overhauled. Where possible, when making important tests, the instrument should be checked before and after use, preferably by the operator.

2. ACCUMULATORS.

Accumulators should be kept fully charged and in good condition. Portable photometers are liable to be used at infrequent intervals; therefore it is important that accumulators should receive regular attention or they will deteriorate.

3. TEST SURFACE.

The test surface should be kept clean and matt, otherwise inaccuracies in readings will occur. Individual instruments should be standardised with their own test surfaces.

4. VIEWING ANGLE.

When taking illumination readings on the test surface the angle of view should be kept approximately at 30° from the normal, or other angle specified by the makers of the instrument. Test surfaces are not perfect diffusers, but, in general, providing the angle of the view is kept constant at 30°, the error due to this imperfection is not appreciable for angles of incidence up to 75°. If the angles of view depart appreciably from this value large errors may occur.

5. ELECTRICAL INSTRUMENTS.

Before taking readings care should be taken to set and maintain the pointer of the electrical instrument on its appropriate setting. In the case of lamps with short filaments, such as are used with these instruments, the change in illumination produced by an error of 1 per cent. in setting an ammeter will produce an error of about 10 per cent., whilst with a voltmeter the error is from 5 to 7 per cent. This indicates the necessity for careful attention to the adjustment of the current or voltage of the comparison lamp supply.

6. SETTING OF TEST SURFACE.

Care should be taken in levelling up the test surface in use. When measuring illumination in horizontal or vertical planes, care should be taken in adjusting the test surface to the horizontal or vertical plane. Most portable photometers are supplied with devices for the purpose.

(b) Physical Type Employing Photoelectric Cells.

1. CALIBRATION.

Instruments calibrated for normal electric and gas lighting should be checked at frequent intervals against a lamp which has been standardised at a colour temperature of 2,700° K. Where possible, when making important tests, the instruments should be checked before and after use.

2. BATTERY.

Street lighting photometers usually require an illuminated scale, and therefore a battery is normally supplied. As these batteries give little warning before running down, it is advisable that a spare dry battery should be kept at hand.

3. LIGHT-SENSITIVE SURFACE.

The photoelectric cell should be carefully handled, and care should be taken to avoid damage to the light-sensitive surface owing to scratching, accumulation of dust, etc.

4. ANGLE OF INCIDENT LIGHT.

Readings should be made with light incident on the light-sensitive surface at angles less than 35° from the normal, unless there is evidence that the cell in question is sufficiently accurate at higher angles of incidence.

5. ZERO ADJUSTMENT.

Before taking readings, care should be taken in setting the zero of the indicator. A small error in this setting may introduce a considerable error in readings of low illuminations.

6. SETTINGS OF LIGHT-SENSITIVE SURFACE.

Care should be taken in levelling up the test surface in use. When measuring illumination in horizontal or vertical planes, care should be taken in adjusting the test surface to the horizontal or vertical. Most portable photometers are supplied with devices for the purpose.

The following hints are, in the main, applicable to both forms of instruments:—

TESTS AT HIGH ANGLES OF INCIDENCE.—When testing street lighting installations, where the degree of illumination is of a low order, and in all cases when the angle at which the light reaches the horizontal plane exceeds 75° with the normal, the horizontal illumination should be calculated from a measurement of the illumination with the test surface normal to the direction of the incident light. The calculation should be performed for each source in turn and the results added together.—(See B.S.S., No. 307—1931, page 16.)

Care should be taken to screen from the test surface any light reflected off the roadway.

AVOIDANCE OF SHADOWS ON TEST SURFACE.—Care should be taken to avoid any obstruction between the test surface and any source of light contributing to the illumination which is being measured.

COLOUR DIFFERENCES.—When sources yielding light of unusual colour (such as mercury and sodium electric discharge lamps) are being tested, suitable colour-correcting filters should be used with instruments of the visual type, and appropriate factors applied to the readings obtained.

If instruments of the physical type are used factors given by the manufacturers should be adopted, or the photometers should be provided with specially calibrated scales or other means of correction.

PRELIMINARY SURVEY EXPEDIENT.—When a large number of test points is involved, it is suggested that, where possible, a survey of the site should be made before the actual test is carried out, in order to select appropriate test points, to measure the heights and angles of lamps to be tested at normal incidence, and to determine what precautions are necessary in order to eliminate the effect of extraneous light sources, etc.

PHOTOMETERS
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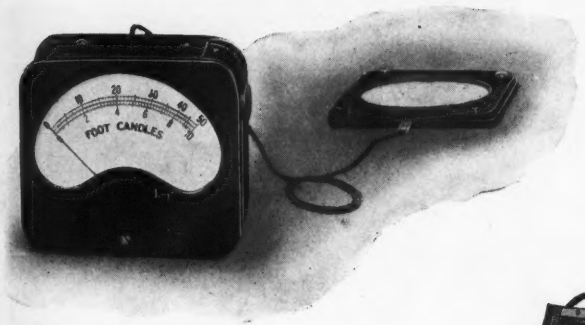

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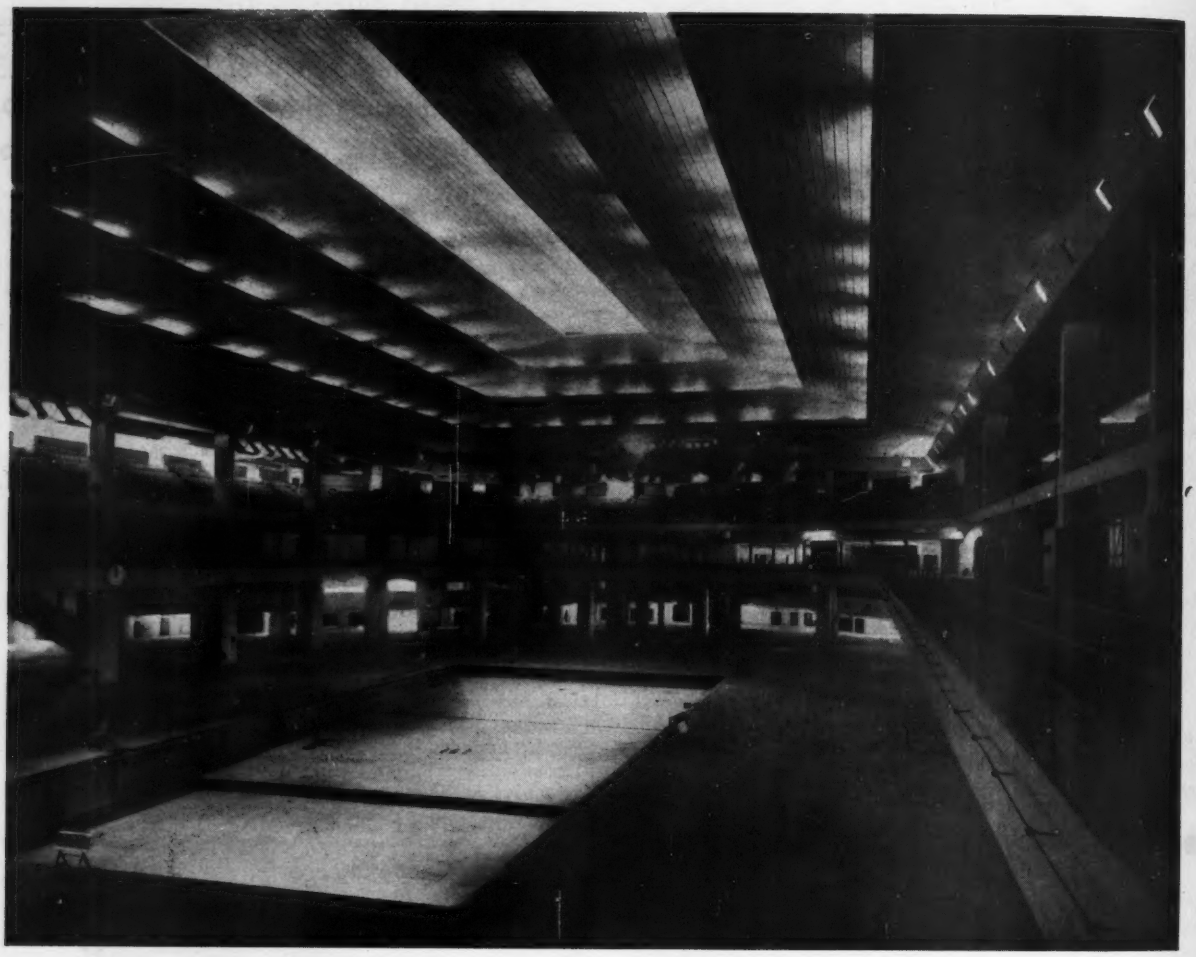


Fig. 1. A General View of the Main Hall at Earl's Court, showing the roof colour lighting installation controlled by BTH Thyratron Reactor Dimmer.

The fine Earl's Court Exhibition building now nearing completion is a remarkable example of modern and engineering skill, and has attracted world-wide interest. It is said to be the world's largest exhibition and entertainment centre.

This great structure of concrete occupies a triangular site—12 acres in extent. One side is 900 ft. long, and the other two are 700 ft., while surrounding the building are extensive private roads and grounds providing parking space for 2,000 cars. The cubic capacity of the building as a whole is 47,000,000 cubic feet. There is a total exhibition floor area of 450,000 sq. ft., including an arena 200 ft. x 350 ft. This arena is capable of accommodating approximately 23,000 spectators. Amongst the constructional material needed for this £1,500,000 building were 80,000 cubic yards of concrete, 24,000 tons of cement, 120,000 of shingle, 60,000 of sand, and 14,000 of reinforcing steel up to 2 ins. diameter; while 125,000 cubic yards of excavation was involved.

For a building of such commanding size a special system of illumination was necessary. We are indebted to The British Thomson-Houston Company for the following description of a very effective lighting installation.

Ceiling Colour Lighting Scheme in Main Hall.

One of the most ambitious schemes of colour floodlighting is installed in the roof above Hall B. The whole of the vast ceiling span, which covers an area of approximately 400 ft. x 250 ft., reflects brilliant kaleidoscopic colour lighting with continuously changing effects ranging over the entire spectrum. This feature is accentuated by the special formation of the ceiling, which has a central span of 200 ft x 50 ft. Below this and surrounding it are three rectangular panels, each stepped down 3 ft. below the one above, the spans being approximately, 100 ft. x 260 ft., 150 ft. x 310 ft., and 200 ft. x 360 ft.

A lighting cove is provided for each panel in which the BTH Mazdalux Colour Floodlighting Equipment is concealed. A total of 416 of these specially designed high-power floodlights have been installed,

each unit being equipped with a selected colour filter giving maximum light transmission.

The optical characteristics of the floodlights are such that the surface of the ceiling is evenly lighted by a wash of colour constantly varying in shade and intensity. The horizontal divergence of each beam is approximately 90° with a vertical divergence of approximately 12°. The diverging beams from adjacent floodlights overlap and are continuously changing, producing a kaleidoscopic colour panorama. Mazda line filament tubular projector lamps are used throughout this scheme (288-500 watt and 128-1,000 watt lamps consuming in all 272 kilowatts).

This unique colour-lighting scheme is automatically controlled by a specially designed BTH

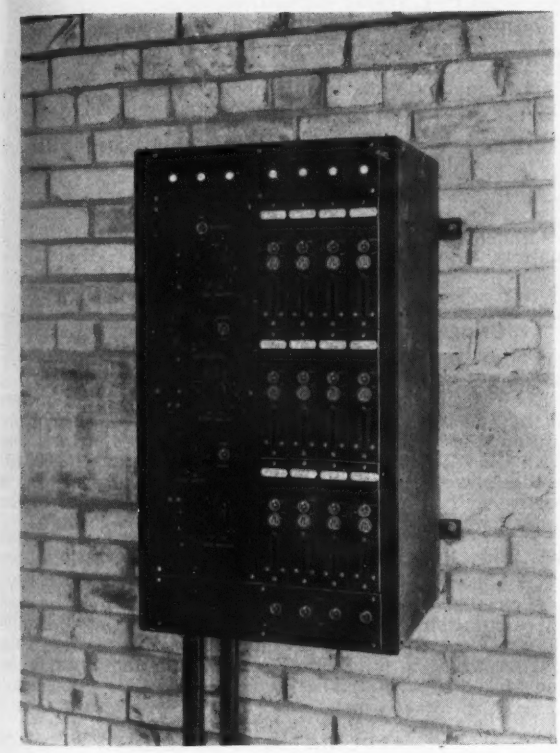


Fig. 3. The Master Control Panel of the BTH Thyratron Reactor Dimmer which operates, by relays, the main contactors controlling the roof colour lighting.

Thyratron Reactor Dimmer. This apparatus (similar to, but larger than, the apparatus installed on the Queen Mary) is capable of controlling a lighting load of 328 kilowatts, embodies 12 circuits, and is arranged for either cyclic or manual control, the master board being provided with colour masters and grand master control. The losses, even in the full dimming position, are low. No special ventilating equipment, such as is necessary with a resistance dimmer to dissipate the heat is required. In addition, the space required for the Dimmer is comparatively small and the cost of maintenance is low.

Swimming Bath—Underwater Lighting Effects.

The swimming pool, a most ingenious structure, is in the centre of the arena, and has a false bottom made in three sections. Any or all of these sections can be raised, by the operation of hydraulic rams, to form part of the exhibition floor, to provide a platform above floor level, or to create desired levels in

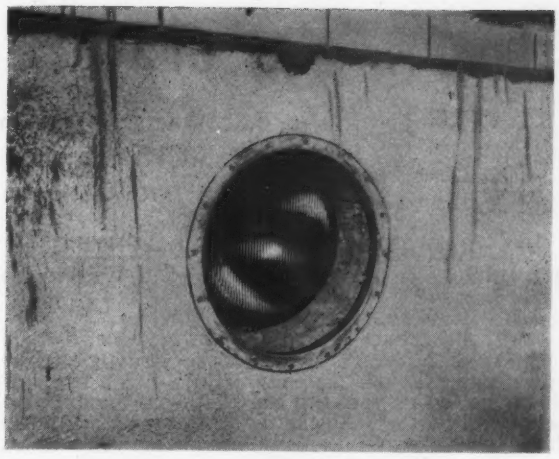


Fig. 2. One of the special underwater floodlight projectors installed in the Swimming Pool. The lighting units are housed behind watertight portholes just below water level.

the swimming pool itself. The pool has a capacity of 2,250,000 gallons of water. Here forty special under-water floodlights, employing 500-watt Mazda lamps, are installed just below water level, to give special lighting effects.

Arena Lighting—Powerful Spotlights.

In addition to the spectacular colour lighting in the main hall, equipment for special lighting effects in the arena has been supplied. This comprises 54 spotlights, each with a 2,000-watt Mazda projector lamp and eleven 80-amp. arc spotlights. These will be used to advantage for the various entertainments and sporting events which are to be staged here.

General Lighting.

In the tea lounge, conference, and banquet halls, as well as other rooms, offices, and staircases, pleasing lighting fittings are installed, and in the foyers and entrance halls concealed indirect cornice lighting with Mazda lamps has been introduced. The spacious car park is also lighted by The BTH Company with special reflector fittings.

All the lighting equipment mentioned above has been installed by Electrical Installations, Limited.

Fig. 4. One of the valve banks and reactors operated by the master control panel illustrated in Fig. 3.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from Page 233, August, 1937)

I.—RADIATION AND GENERAL PHYSICS.

222. Ultra-violet Energy in Daylight—A Two-Year Record.

M. Luckiesh, A. H. Taylor, and G. P. Kerr. Frank. Inst., J., 223, pp. 699-714, June, 1937.

The authors report results of an investigation over two years into the amount of ultra-violet energy in daylight, and its variation during the day and with the season of the year. As the tests were conducted mainly from an erythemal viewpoint, the energy at each wavelength was corrected for erythemal effect, and the unit used is the E-viton. Many interesting results are forthcoming. S. S. B.

II.—PHOTOMETRY.

223. The Luminous Field and Its Application to Photometry.

A. A. Gursun. R.G.E., 42, No. 1, pp. 5-12, July 3, 1937.

Deals with the subject under the headings "The fundamental theories of the luminous field" and "The vectorial method for photometric calculations." W. R. S.

224. Research on Selenium Photoelectric Cells.

L. Bergman and R. Pelz. Zeits für Techn. Physik No. 7, pp. 177-191, July, 1937.

A detailed account of the properties of selenium cells, dealing with temperature coefficients, linearity of response, effect of different coloured lights, etc. W. R. S.

225. Device which Measures Surface Reflection.

Anon. El. World, 108, p. 238, July 17, 1937.

A device for determining the reflection factor of opaque materials or the transmission factors of transparent or translucent materials is described. The factor measured is the total percentage of incident light that is reflected or transmitted. S. S. B.

III.—SOURCES OF LIGHT.

226. High Intensity Light Sources.

J. A. V. Fairbrother. El. Rev., Vol. CXXI., No 3,115, p. 177, August 6, 1937.

Gives the results of measurements of intrinsic brilliance on tungsten projector lamps, carbon arc lamps, and water-cooled extra high-pressure mercury vapour lamps, and points out the advantages of the latter, such as ease of operation and high efficiency. R. G. H.

IV.—LIGHTING EQUIPMENT.

227. Improving Lamp Efficiency.

Anon. El. Rev., Vol. CXXI., No. 3,116, p. 215, August 13, 1937.

Describes the use of a prismatic glass ring surrounding the lamp, which redirects horizontal rays on to the working plane, and thus increases the illumination. R. G. H.

228. Mercury-Vapour Lamp Transformer.

Anon. El. World, 107, p. 2,220, June 19, 1937.

A description is given of a special design of transformer for use with high intensity mercury vapour lamps, in which special precautions are taken against over-heating. Special connection terminal panels also are used. S. S. B.

229. The Control of Light with Louvres.

W. E. Folsom. Am. Illum. Eng. Soc. Trans., 7, pp. 734-752, July, 1937

The paper describes briefly methods and types of louvre design, and summarises their applications, especially in architectural lighting. J. S. S.

230. Luminous Surfaces for Architectural Lighting.

J. A. M. Lyon. Am. Illum. Eng. Soc. Trans., 7, pp. 723-733, July, 1937

Gives full details of the design of a lay light using specular reflectors and a single lamp. A high luminous efficiency is claimed. J. S. S.

231. Road Traffic Control (Electric) Light Signals.

(*British Standard Specification*, No. 505.—1937.)

This is a revision of the specification issued in 1933. The optical requirements of signals, including such matters as distribution of light, direction of beam, colorimetric properties of the glass screening from extraneous light, height of signal, etc., are dealt with in Part 1. Part 2 deals with signal construction, and Part 3 with control requirements. J. S. D.

232. Light-Ray Traffic Signals.

Anon. El. Times, 92, p. 56. July 8, 1937.

An account, with diagrams, of a traffic-control signal installation, in which the traffic is recorded by photo-electric methods instead of the more usual pads in the road. W. R. S.

233. Eclairage et Signalisation des Mobiles sur les Routes.

R. Boutard. Lux, No. 6, pp. 87-94, 1937.

An informative article, discussing the use of lights for signalling purposes on motor vehicles, bicycles, etc. Methods adopted by cyclists are criticised, and such matters as rear signals, including "stop" lights, are treated. J. S. D.

234. Synchronised Beacons Mark World's Greatest Bridge.

P. B. Garrett. El. Journal, Vol. 34, No. 7, p. 273, July, 1937.

Six rotating beacons give prominence to the towers of the San Francisco—Oakland bridge. The beacons are equipped with parabolic, silvered-glass reflectors, and with 32-volt., 1-kW. lamps, each producing 8,000,000 candle-power. Operating condition of each beacon is portrayed on a miniature replica of the bridge in the control house at Oakland. R. G. A.

235. Slide Rule Speeds Lighting Calculations.

Anon. El. World, 107, p. 2,046, June 5, 1937.

A circular calculator is described, which may be used in calculations involved in designing lighting installations. The principle is that of the ordinary slide rule, but by using a number of scales each factor may be considered separately. S. S. B.

V.—APPLICATIONS OF LIGHT.

236. Better Light—Better Sight—Better Work.

Anon. El. World, 108, p. 36, July 3, 1937.

Some details are given of the lighting provided for pea and bean sorting in an American seed company. S. S. B.

237. Educate the Public on Better Light.

Morris Fishbein. El. World, 107, p. 2,009, June 5, 1937.

The author discusses the importance of good lighting from the medical point of view. He gives data on the improvement in work resulting from higher illumination, and on the increase in illumination necessary with increasing age for equal performance of a task. S. S. B.

238. What Good Lighting Means to Industrialists.

Dean M. Warren and A. K. Gaetjens. El. World, 107, p. 2,170, June 19, 1937.

The importance of good lighting in industry is emphasised, not only from the point of view of increase of output, but from the general health and spirit of the employees. Several installations, covering a wide variety of processes, are described. S. S. B.

239. Lighting in Factories and Workshops.

Home Office Welfare Pamphlet (His Majesty's Stationery Office).

A reprint of the familiar welfare booklet. The fundamental requirements of good lighting are set out and the causes of unsatisfactory lighting analysed. Quotations are made from the recommendations of the De-

partmental Committee on Lighting in Factories and Workshops, and references are made to some more recent D.S.I.R. researches. At the end are a number of illustrations showing good and bad methods. J. S. D.

240. Lighting of Public Highways.

M. Cohu. R.G.E., 42, No. 4, pp. 111-116, July 24, 1937.

A statement of problems involved in street-lighting. The importance of contrast between street surface and object is emphasised. W. R. S.

241. Public Lighting in Paris.

A. Janet. R.G.E., 42 No. 4, pp. 117-123, July 24, 1937.

An account, with photographs, of recent public lighting developments in Paris. W. R. S.

242. Lighting of Arterial Roads in the Suburbs of Paris.

A. Pux and R. Vialatel. R.G.E., 42, No. 4, pp. 123-124, July 24, 1937.

An account is given and a table summarising observations of lighting on arterial roads near Paris. W. R. S.

243. Colour Corrected Sodium Lighting.

Anon. El. Times, 92, p. 153, July 29, 1937.

A short description and photograph of a street-lighting installation in which one 90-watt sodium lamp is used in conjunction with three 100-watt tungsten gas-filled lamps. The results are said to be good. W. R. S.

244. Light and Architecture—Fixtures—Modern and in Period.

W. W. Kantack. Am. Illum. Eng. Soc. Trans., 7, pp. 705-712, July, 1937.

Some representative architectural lighting schemes are described with photographs. J. S. S.

245. Artistic Lighting.

J. B. Harris. El. Rev., vol. cxxi, No. 3112, p. 79, July 16, 1937.

Examines the conditions which apply to the design of interior and exterior illumination schemes. Close co-operation between architect and illuminating engineer is advocated. R. G. H.

246. Fluorescent Tube Interior Illumination.

Anon. El. Times, 92, p. 27, July 1, 1937.

The development of high voltage discharge tubes coated internally with fluorescent powders has led to new methods of interior lighting. An account of some tubes and their uses is given, with a photograph. W. R. S.

247. La Lumière à l'Exposition Internationale des Arts et Techniques.

X. Rougement. Lux, No. 6, pp. 81-86, 1937.

An illustrated description of the lighting of the International Exhibition in Paris, which falls into four main sections, namely: (1) Illuminations on the Seine and at the Eiffel Tower; (2) Lighting of avenues, etc.; (3) Exterior illumination of pavilions; and (4) Interior lighting. Special attention is devoted to the water displays. J. S. D.

248. Lighting at the Louvre.

Anon. Elect., 119, p. 71, July 16, 1937.

A description is given with photographs of new lighting effects at the Louvre. C. A. M.

249. Colour Lumiline Adds to Night Club Load.

L. I. Whitchurch. El. World, 108, p. 82, July 3, 1937.

Details are given of a new lighting installation at an American night club. The main interest lies in the extensive use of coloured lumiline lamps. A standard length lamp (18 in.) is used, and an illustration is given of the fixing strip used. S. S. B.

250. "Pill Boxes" Light Hershey Ice Palace.

Anon. El. World, 107, p. 2208, June 19, 1937.

A description is given of the lighting of the Hershey Ice Palace, which possesses several novel features. S. S. B.

251. Colour Floodlighting.

Anon. G.E.C. Journal, viii, pp. 209-212, August, 1937.

A number of colour photographs are given showing effects produced in the recent Coronation floodlighting. C. A. M.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 467,307. "Improvements in and Relating to Light Projectors."

The British Thomson-Houston Company, Limited. Dated September 11, 1935. *(Convention, U.S.A.*

This specification describes a projector having a pivoted support for a lamp whereby the lamp may be moved to either of two alternative positions in relation to a reflector. The lamp support is moved in response to successive energisations of the lamp. The movement may be effected by a toggle connected to a cam, the toggle being operated by a coil in the lamp circuit.

No. 467,692. "Improvements in or Relating to Electric Discharge Lamps."

The General Electric Company, Limited (Communicated by Patent-Treuhand-Gesellschaft für Elektrische Glühlampen m.b.H.) Dated March 17, 1936.

This specification discloses a discharge lamp particularly for producing violet coloured light in which the neon spectrum is excited by a discharge through a filling which is at least mainly neon and a luminescent material, preferably blue-luminescent, is excited by the discharge. The light emanating is filtered by a filter which transmits at least a part of the red light from the neon spectrum. The luminescent material may be calcium tungstate or other tungstate, or certain of the phosphates, borates, and sulphides.

No. 467,697. "Improvements in Reflector Signals."

General Motors Corporation. Dated May 9. 1935.

This specification discusses the conditions under which autocollimating reflectors usually operate and points out that the angle in a horizontal plane through which effective reflection of light towards the source is required is greater than the angle in the vertical plane. Accordingly the specification discloses an autocollimating reflector comprising two vertical reflecting surfaces at right angles to each other, by which light is reflected back to the source through a wide angle in one plane, in combination with cylindrical light condensing means having a horizontal axis by which the angular range in the other plane is governed.

No. 467,698. "Improvements in Landing Headlamps for Aircraft."

Julias Pintsch Aktiengesellschaft. Dated June 26, 1935. *(Convention, Germany.)*

This specification relates to aircraft landing headlamps wherein the direction of the beam is adjustable independently of the disposition of the headlamp casing. The optical system, consisting of a mirror and lens having a common focus, is mounted in ball and socket bearings to be capable of pivoting about the common focal point.

No. 467,820. "Improvements in or Relating to Electric Discharge Lamps."

The General Electric Company, Limited. (Communicated by Patent-Treuhand-Gesellschaft für Elektrische Glühlampen m.b.H.) Dated December 10, 1935; *February* 12, 1936. *(Cognate Applications.)*

This specification describes a discharge lamp adapted to operate on substantially sinusoidal alternating current and filled with a mixture of two gases or vapours having different ionisation potentials. The lamp is given such an electrical dissymmetry that, even on sinusoidal alternating current, sufficient separation by electro phoresis of the component gases or vapours occurs to cause excitation of, and the production of, the spectrum of one of them near one electrode of the lamp and of the other near the other electrode. The spectra of both gases or vapours are thus produced.

No. 467,940. "An Improved Device for Furnishing Anti-Glare Illumination from Automobiles."

Gomory, A. B. Dated April 16, 1936.

This somewhat optimistic specification describes a headlamp arrangement comprising a projector with the light source not normally visible and tilted to project its beam at an upward inclination. The projected beam falls upon a reflecting surface and is redirected in or below the horizontal plane. The reflector may be flat or curved and may be tiltable under the driver's control.

No. 468,146. "Improvements in or Relating to Photo-Electric Cells."

The General Electric Company, Limited, and Simms, C. H. Dated March 4, 1936.

According to this specification a secondary emission photo-electric cell comprises a substantially spherical envelope over part of the interior surface of which the cathode is deposited, an auxiliary electrode, of which the dimensions are small compared with the mean radius of the envelope, located substantially at the centre of the envelope, and a grid-like anode surrounding the auxiliary electrode. The cathode may be prepared by heating oxidised silver in caesium vapour, and the auxiliary electrode may be of silver.

No. 468,217. "Improvements in and Relating to Illuminated Signs."

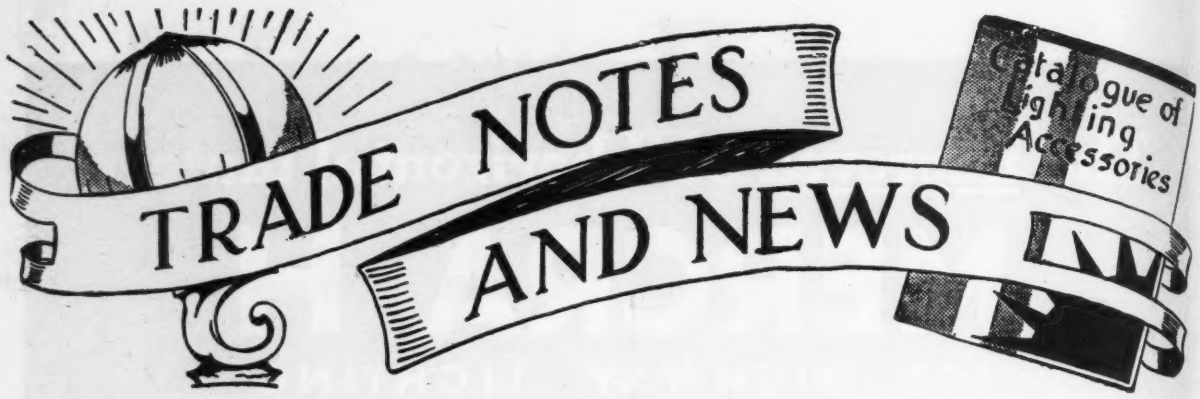
Law, T. Dated December 31, 1935.

This specification covers an illuminated sign of the kind in which transparent signs are mounted in a casing containing a light source. The sign is built up of independent units, each representing a letter, and each comprising a casing with an opaque front wall provided with a slot shaped as the letter in which is supported a similarly shaped piece of glass rod evenly illuminated by the light source.

No. 468,436. "A New or improved System for Lighting Roads, Aerodromes, Wharves, and Similar Surfaces."

The Safe-Beam Lamp, Limited, and Laird, W. H. Dated December 2, 1935.

This specification describes a cabinet for road-etcetera-lighting containing one or more projectors arranged to give flat-topped focused beams below eye level, the cabinet having one or more windows through which the light issues, of distinctive shape or colour, the interior of the cabinet being generally illuminated by means of an internal reflector and stray light from the projectors or by a separate light source, so that the windows are distinctively visible and will not be liable to confusion with other lights, such as those of approaching vehicles.



Crompton Neophan Lighting Units

The problem of achieving even approximate resemblance to daylight has always been a difficult one. It is, of course, a familiar fact that illuminants dependent on incandescence yield a spectrum with a preponderance of yellow. The colours of objects seen by their light are accordingly distorted. Correction can be effected by the use of daylight filters. But in order to obtain accurate results much loss of light by absorption is usually necessary, and even if only good visual resemblance to daylight is aimed at the use of a supplementary filter is something of a drawback.

Much interest, therefore, attaches to the new lighting Neophan lighting units introduced by Crompton Parkinson, Ltd., in which the correction is effected by introducing a new material (neodym oxide) into the actual glassware during the manufacturing process.

The effect of this component is to correct the excess of yellow and produce a pleasing daylight effect, and at the same time good diffusion and softness of shadows can be secured.

It is believed that these new units will prove helpful in relieving eyestrain and giving better visibility in offices and other places where exacting demands are made on the eyes, and that they will prove specially acceptable in shops, hotels, and other places where attractive lighting is in great demand and "good appearance" of objects illuminated is an important consideration.

Fluorescence on the Stage

Readers will remember a discussion on phosphorescence and fluorescence opened by Mr. F. E. Lamplough before the Illuminating Engineering Society some time ago, which was illustrated by many striking experiments. We have received from Cleveland, Ohio, interesting evidence of the applications of these effects on the stage and elsewhere in the form of a leaflet dealing with the "Conti-Glo" materials. These substances are capable of glowing in a variety of colours when exposed to ultra-violet light. Lacquers, water colours, costume dips, artist oils, make-up, and invisible liquids can be furnished, and some specimens are enclosed.

An inset shows the kind of transformations that can be effected. The appearance of dancers by ordinary light can be completely changed under ultra-violet radiation. Remarkable transformations in scenic effects can be obtained—figures being made to appear or disappear or landscapes altered. The latter effect is utilised in a restaurant the walls of which can be caused to glow with pictures in vivid colours in the dark.

A New Bulkhead Fitting

There is always room for new fittings for special purposes. An instance is afforded by the Holophane bulkhead unit illustrated below. This pleasing picture shows its merits on board ship, where economy in space is an important consideration. The unit combines compactness not only with diffusion of light, but with useful directive power. A close-up view of this unit is presented in Fig. 1.

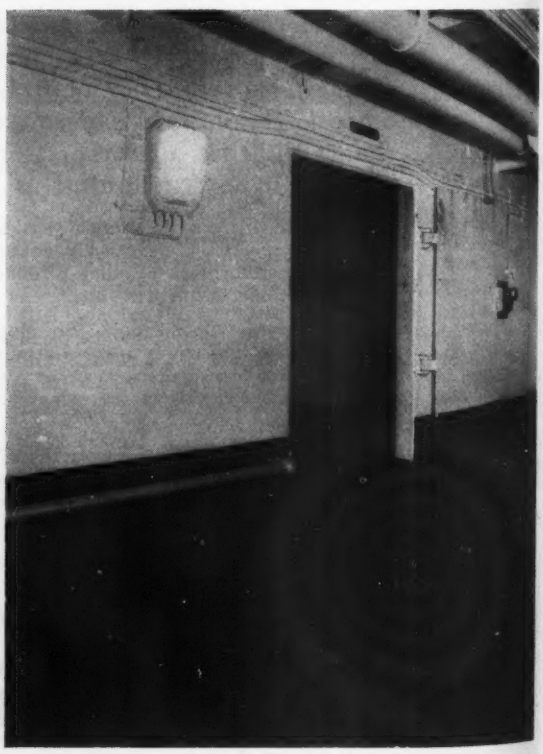


Fig. 1. A close-up view of the Holophane marine type Widerlite Bulkhead Fitting.

Fig. 2. Showing the Holophane marine type "Widerlite" bulkhead fitting in use on S.S. Fenella, a new passenger vessel built by Messrs. Vickers Armstrong Ltd. at Barrow-in-Furness.

Fig. 2 illustrates the use of this new fitting on board ship. The fitting's unit has a specially drilled back plate so as to take packing glands with lead-covered armoured cable. We understand that the fitting is being widely used on passenger steamers of the Isle of Man Steamship Company, and no doubt it will prove equally acceptable on other vessels.

New Lighting at Croydon

Many of our readers are doubtless familiar with the extensive installation of sodium lamps at Purley Way, near Croydon, the first in this country. Another installation in that district of interest is that in the Norbury-avenue (running from London-road to Beulah-road), Croydon, which is used largely as a cross route by motor traffic. Commencing outside Norbury station and extending for some distance Revo refractor fittings and the new "Philora" 80-watt mercury discharge lamps have been introduced with excellent results, illustrated in the above picture. This road is an example of a residential road which yet carries a considerable amount of traffic, and the method of lighting is an instructive example of methods of dealing with this quite usual problem.

It should be realised that the character of roads often changes quite quickly in the present day. This applies also to London proper, where not a few roadways, originally purely residential, have become arteries of traffic in and out of the City. In all such cases improved lighting, appropriate to the changed conditions, is needed.

A Restlight Installation

The adjacent picture shows part of the Lending Library in the Central Library, Croydon. The general lighting is furnished by fifteen 14-in. Restlight bowl fittings, equipped with 150-watt lamps and mounted 9 ft. 6 in. above the floor. Eighteen 10-in. fittings, having 100-watt lamps, are attached to the ceiling above the gallery, and there are seventeen 10-in. fittings under the gallery.

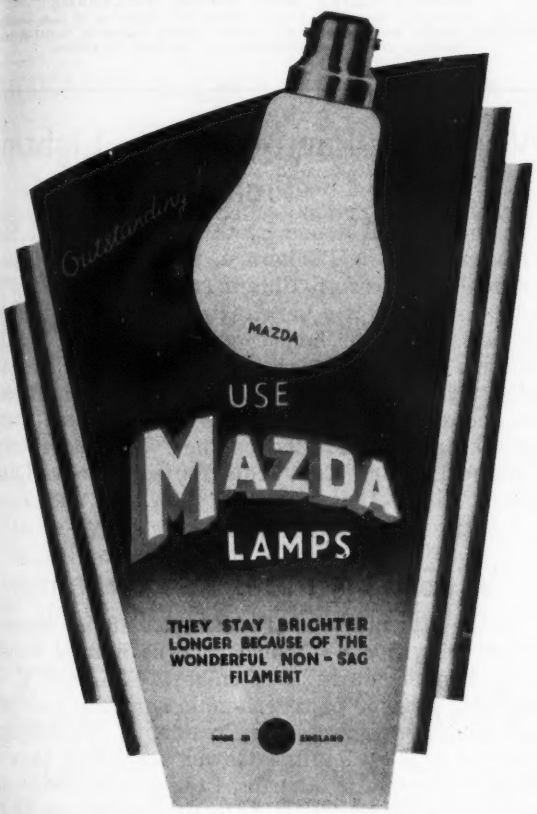
Local lighting is provided by the 10-in. fittings, which have conical, opal reflectors and are mounted direct on the ceiling. A problem arose owing to the restriction of space under the gallery. Here the fittings were recessed, so as to project only 2½ in. It was thus found possible to avoid using lamps in a horizontal position, and the results have proved completely satisfactory. The diffused light, approximating to daylight in colour, is considered specially advantageous in libraries.

The 1937-8 Lighting Season

Publicity of Leading Lamp Companies

There is evidence that the coming season is likely to be a very active one. We have received an exceptional amount of publicity literature from leading lamp companies, some of which is here illustrated.

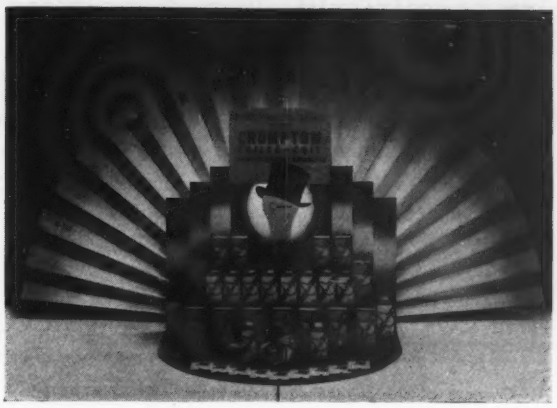
The British Thomson-Houston Co., Ltd., have produced a catalogue containing fifty-six pages (an increase over that for last year), with a coloured inset featuring the Mazda Mickey Mouse lights, and a wide range of showcards and display material.



The leading theme in the programme of the General Electric Co., Ltd., is "Osram—The Wonderful Lamp." This appears on striking posters, in which red, blue, and yellow predominate. There is a great variety of showcards and leaflets; one, a coloured facsimile of the well-known Osram lamp carton, is arranged to open in book form, showing inside a range of prices of popular lamps. The illuminated window-displays are linked up with the slogan, "O for an Osram," which, it is considered, is likely to prove a winner among catchwords during the coming season. Lists giving full details both of general service lamps and lamps of special types are available, and there is a finely-produced thumb-indexed catalogue of sixty-four pages.

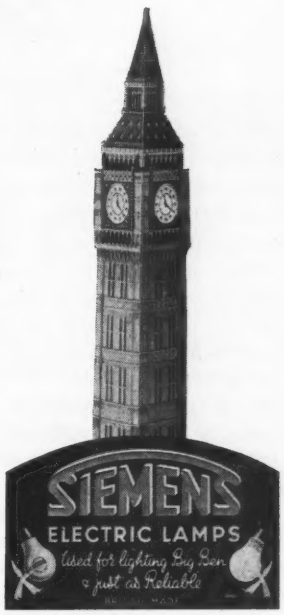
A novel note is struck in the "Hat" campaign developed by Crompton Parkinson, Ltd., which is illustrated above, and ties up with display material. This is supplemented by two well-presented booklets, "The Crompton Book of Commercial Advertising" and "The Crompton Story of Seeing." One feature of a recent brochure is the picture of the new and imposing lamp works, built as a result of the ever-increasing demand for the company's products. One must also offer congratulations on the very novel get-up of the leaflet "showing which way the wind blows."

The Cryselco display material this year is of a very distinctive character, the dominant feature being Windsor Castle, which appears to good effect in numerous coloured showcards. One is glad to see, however, that our old friend "Col. Chris Elco of the Light Brigade" is still in being and makes his appearance in one of the display cards before us.



A view of one of the Crompton display cards with which the characteristic "hat" idea is associated.

The adjacent picture is one of the most effective embodied in the lamps publicity campaign of Siemens Electric Lamps and Supplies, Ltd. Others utilise the slogan, "Brighter and Better," and there is also one featuring an owl ("Be Wise—Save Your Eyes"). The actual window display, showing Big Ben, is over 50 in. in height, and the front portion, illustrating pearl and opal lamps, is executed in seven colours. Behind is an electric bulb, so placed as to flood the whole tower with light; at the same time the clock face becomes illuminated and the word "Siemens" on the front portion glows with orange light.



An attractive display; here Cryselco lamps are linked to the Windsor Castle view which is being widely used in the present campaign.

Electric Lighting in Works and Offices

Conference in Bradford

An important step in connection with the conferences arranged periodically by the E.L.M.A. Lighting Service Bureau in conjunction with other electrical interests, is the organisation of an illumination design course in Bradford during September 21 and 22.

The course, which deals largely with industrial lighting problems, is to be inaugurated by the Lord Mayor of Bradford (Alderman G. R. Carter) at a luncheon on the opening day. Thereafter there will be addresses by Mr. W. J. Jones, Mr. J. W. Howell, Mr. H. Lingard, and Mr. T. N. Aldington. The subjects to be dealt with include Light and Sight, Electric Discharge Lamps, Planning Lighting Installations, Floodlighting, and Special Lighting Problems. Visits to a number of well-lighted factories in the Bradford area will also be arranged.

As is usual on such occasions the discussions will be opened by local experts. We note that Mr. T. Roles, the city electrical engineer, will set the ball rolling after the opening address by Mr. W. J. Jones.

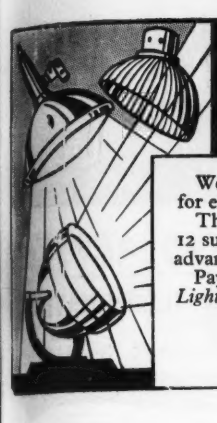
The meetings will be held in the Saloon Mechanics Institute, Bradford, and the conference, which seems well suited to this important industrial centre, should be a very successful one.

Women's Part in the Lighting Field

In the Journal issued by the Société pour le Perfectionnement de l'Eclairage, relating to the International Congress on Illumination, held in Paris in June last, there is a very instructive account of the Women's Section, before which a paper by Miss Caroline Haslett was read. We hope to refer more fully to this matter shortly. One notes with interest the active part which women in the United States are taking, as illustrated by the "Demonstration of a Home Lighting Call," contributed by Miss Lilian Eddy.

W.E.S. Annual Conference

At the fifteenth annual conference of the Women's Engineering Society, which is to be held at Crosby Hall, London, during September 24-26, Mrs. C. H. Douglas, director of the Hamble shipyard, will succeed Miss Amy Johnson as President. The technical papers by Miss Pauline Gower and Miss Dorothy Spicer, directors of Airtrips, Ltd., will deal with aircraft problems. The conference will visit the Engineering and Marine Exhibition at Olympia. The programme also includes a dinner, at which Miss Amy Johnson will preside, a visit to the theatre, and a "mystery tour," so that those who take part in the conference will not lack entertainment.



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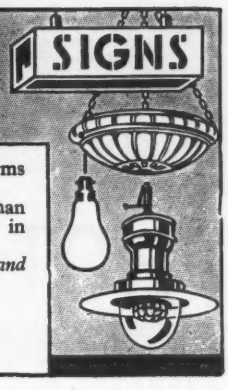

We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3¼ inches wide) are given below.

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Index to "Where to Buy"

N.B.—The numbers are those attached to individual entries in the Directory (See pp. 269-271).

Electric Discharge Lamps

An excellently produced bulletin under the above title, issued by the E.L.M.A. Lighting Service Bureau, traces the development of the electric discharge lamp. After a brief explanation of the working of such lamps the diminution in size of the hot cathode tube as compared with the cold cathode tube is represented pictorially. Diagrams are also given contrasting the line spectrum of the discharge lamp with the continuous spectrum obtained from an incandescent filament.

In view of the somewhat varied assumptions in regard to efficiency that are sometimes made, the tabular data on this point are useful. The highest value credited to mercury discharge lamps of standard type is 45 lumens per watt for the 400-watt size. For sodium lamps 51 to 64 lumens per watt are given, whilst the life-hours for mercury and sodium lamps are stated to be 1,500 and 2,500 respectively. A brief account of the latest 125-watt and 80-watt lamps (with bulbs closely resembling those for incandescent lamps in size and shape), is also given. Methods of colour correction, such as the combination in the same lamp of a filament with the column of luminescing mercury vapour, are also touched upon. With such lamps 25 and 21 lumens per watt, for the 500- and 300-watt sizes, respectively, may be expected.

For industrial lighting, as is well known, these lamps are finding considerable favour. One advantage which is perhaps not widely known is the freedom from vibration trouble, i.e., they are unlikely to be affected, as fragile filaments may be, by the shocks and vibrations of ordinary industrial operations.

Considering the few years that have elapsed since the electric discharge lamp was first introduced, the progress in this field has been little less than miraculous.

Personal

We learn that Mr. N. H. Denholm, a member of the Illuminating Engineering Society, has been appointed Assistant Public Lighting Engineer under Mr. E. C. Lennox, who is associated with the North Eastern Electric Supply Company, Ltd., Newcastle-upon-Tyne.

Catalogues and Advertising Literature

We invite all firms in the Lighting Industry to send us new catalogues as they appear, for reference in these columns

BEANTREE ILLUMINATIONS, LTD.—Leaflet illustrating "Silvaray" internally silvered lamps.

BRITISH THOMSON-HOUSTON CO., LTD.—Catalogue of standard and special Mazda lamps, with coloured inset, featuring "Mazda Mickey Mouse Lights" and other Christmas decorative novelties. Also "Lamp Quality," a descriptive leaflet by A. B. Whitworth, summarising the evolution of the Coiled Coil Mazda Lamp.

CONTI-GLO LUMINESCENT PRODUCTS.—Leaflets dealing with lacquers, water colours, costume dips, etc., fluorescing in ultra-violet light.

HOLOPHANE, LTD.—Illustrated Catalogue dealing with lanterns and other street lighting equipment, includes useful technical data.

METROPOLITAN VICKERS ELECTRICAL CO., LTD.—List of "Cosmos" electric lamps.

RESTLIGHT, LTD.—Illustrated Catalogue featuring the Lamplough Matching Lamp and also Restlight units for general use.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.—Illustrated Catalogue featuring standard and special filament lamps, also neon lamps for signs, etc.

New Earl's Court Exhibition Lighting

We are interested to hear, in connection with the new Earl's Court Exhibition, dealt with elsewhere in this issue (pp. 258-9), that the electric fittings in the basement and mezzanine restaurants, conference halls, basement crush halls, and main entrance were designed and manufactured by Messrs. F. Stadelmann, and Co., Ltd.

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